



India's National Hydrogen Mission

India on a mission possible?



The Union Budget of India for the Financial Year 2023-2024 announced by Hon'ble Minister of Finance, Smt. Nirmala Sitharaman, reinforces the vision of The Hon'ble Prime Minister of India, Shri Narendra Modi, for a clean, green, energy-secure, and sustainable development in India. The development of India's green hydrogen ecosystem was strengthened when Shri Modi launched the National Green Hydrogen Mission on India's 74th Independence Day, 15 August 2021. The Ministry of Power released the first phase of the policy in February 2022. The policy set the wheels in motion for the hydrogen ecosystem in India by addressing some supply side issues with a view to reducing cost of hydrogen production and also looked to

create ease of doing business. The detailed National Hydrogen Mission document ("NHM") was subsequently released on 13 January 2023 after cabinet approval. The NHM attempts to take a holistic view across the value chain and looks at various levers for accelerating the green hydrogen economy and indicates a roadmap for rolling these out.

While the current release is not a policy document and stops short of stipulating concrete and measurable targets in critical areas, such as consumption obligations, it still sets a strong foundation towards developing robust policy enablers.

The NHM provides a clear roadmap for the actions that are planned to be taken to create a green hydrogen economy

The NHM¹ indicates an expected outcome of 5 MTPA green hydrogen production by 2030 with an associated renewable energy capacity addition of nearly 125 GW. The NHM not only reinforces the previously announced target of the Government but also suggests setting production ambition higher at 10 MTPA considering exports and international partnerships.

The NHM provides an overall financial outlay of INR19,744 crore (USD2.47 billion²) for the sector with INR17,490 crore allocated towards incentives through the SIGHT* programme and balance towards pilots, R&D and other components. The NHM envisages that this will catalyse investments of INR8 lakh crore (USD100 billion) into the sector and result in creation of over six lakh jobs. The resultant usage of green hydrogen in emission heavy sectors such as oil & gas, chemicals & fertilisers, etc. is expected to result in abatement of 50 MTPA of carbon dioxide emissions¹.

NHM suggests a pragmatic pathway in two phases for evolution of the sector. This starts with Phase I (2023-24 to 2025-26) with hydrogen adoption in low hanging areas such as refinery, fertilisers and city

gas sectors where hydrogen can be a drop-in fuel or feedstock. The document recognises that to spur the hydrogen economy in Phase I, it is imperative to look at creating demand through demand side mandates and other measures, at the same time enabling low-cost supply, by measures to reduce costs as well as create adequate domestic electrolyser manufacturing capacity.

This phase will also focus on the other building blocks of a robust ecosystem such as regulations and standards, harmonised with international norms. With the aim to accelerate the green hydrogen transition, Phase I will in parallel focus on R&D and pilots across the value chain and in new end use areas as steel production, long-haul heavy-duty mobility, and shipping.

Phase II (2026-27 to 2029-30) is expected to focus on accelerated growth in sectors such as refinery and fertilisers where GH is expected to become cost competitive, commercial scale projects in areas such as steel, mobility, and shipping, with R&D/ pilots in new areas such as railways, aviation, etc.

* Strategic Interventions for Green Hydrogen Transition

¹ National Hydrogen Mission, Ministry of New and Renewable Energy, Govt. of India, 13 January 2023

² USD/INR=80



Some notable aspects of the NHM which need a special call out are:

1. The mission doesn't shy away from acknowledging the challenges as also bringing to fore the key pieces which need to fall in place. First, reducing the cost of renewable energy, which is paramount towards ensuring that the economics remain in the plausible frame. Next on, increasing the domestic electrolyser manufacturing capacity. While target for the same is not officially announced as yet, this is widely expected to be around 60 GW/yr, of which 15 GW/yr could be supported by PLI as per media statements by the Hon'ble Minister of Power and New & Renewable Energy, Shri RK Singh³. Third and most importantly, demand generation.

2. The provision of a clear governance framework where MNRE has been designated as the overall agency for co-ordination amongst several ministries to help develop policies, finances and promote offtake of hydrogen in their respective areas, like road transport, railways, steel, oil refining, chemicals & fertilisers, shipping.

The NHM provides a detailed organisational structure, including an empowered group under cabinet secretary, advisory committee and a mission secretariat headquartered at MNRE to ensure effective implementation of the NHM. This allocates responsibilities to other ministries as well to ensure offtake, develop finances and other such crucial work.

3. The mission document clearly drives home a determination to crack the code with a defined roadmap and timelines. For instance, it makes it clear that this is an initiation for a set of norms and policies which are at various stages

of evolution, and we should expect much more policy action over the next 12-18 months. These include the adoption of international standards, design and launch of bid processes, notification of targets and incentive schemes, and further build on for R&D roadmap to name some.

4. The NHM recognises and attempts to develop other decentralised and carbon-neutral hydrogen production methods to augment green hydrogen production, like biomass-to-hydrogen, small electrolysers integrated to rooftop solar and small hydro projects. etc.

5. The NHM takes a holistic approach towards ecosystem development and there is strong emphasis in areas such as manufacturing, standards, compliances, skill development and education to help hone the skills of the future workforce. There is a recognition of the need to create public awareness and measures such as development of an on-line portal on hydrogen has been announced.

6. There is a clear direction towards a phased R&D approach with public private partnership and collaboration at its core.

While the road map is to be further delineated by the Advisory Group, the NHM provides emphasis on not only manufacturing but also storage, transportation and utilisation of hydrogen and aims to address efficiency, safety, and reliability of systems and processes. The mission also announces a public private partnership framework for R&D, Strategic Hydrogen Innovation Partnership (SHIP) aimed at garnering financing for R&D and encouraging innovations.

³Times of India, 6 January 2023

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We have a large enough domestic market to start with and that should be the focus until exports from Indian projects become globally cost competitive



NHM: A great start for Indian GH sector

Targets

5 MTPA

Overall GH production target



125 GW

RE capacity installation (to support GH target¹)



Financial Support

INR19,744 cr. / (USD2.47 billion²)

INR17,490 cr.

SIGHT programme (Electrolyser Mfg. and GH projects)

INR1,466 cr.

Pilot projects



Overall NHM financial outlay

INR400 cr.

R&D

INR388 cr.

Other components



Envisaged outcomes

50 MTPA

Overall CO₂ emission abatement



INR8 lakh cr. / USD100 billion²

Overall investment in GH sector



6,00,000

Expected green jobs generated



Organisation structure

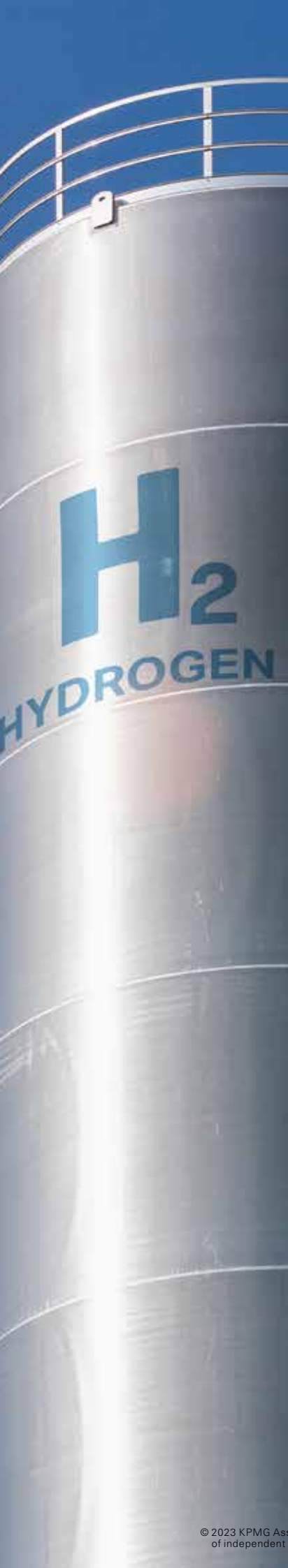


- Mission Secretariat to be in MNRE and NHM to be led by MNRE. Secretariat to be headed by Mission Director.
- Chaired by Empowered Group headed by Cabinet Secretary
- Empowered Group to contain members from end-use ministries like MoPNG, MoP, Shipping, Railways, MoRTH; Niti Aayog; Scientific Advisors and Industry members
- Will be supported by Advisory Group comprising of Scientific Advisor to GoI, Academic and Research Institutes, Industry etc.

Notes:

1. NHM targets are till 2030
2. USD/INR=80

The NHM provides a promising start and helps send a positive signal to the industry to reiterate India's seriousness to create a green and energy-secure economy. However, some concerns do remain, and a 10-point agenda is suggested below which if considered, can further accelerate the green hydrogen economy.



A 10-point growth agenda for the NHM

01



Incorporating sectoral demand mandates

02



Rationalising incentives

03



Holistic R&D for self-sufficiency

04



Standardizing definitions, safety, certifications

05



Making exports competitive

06



Harmonising taxes and duties

07



Facilitating financing and attracting investments

08



Manufacturing clusterization and indigenization

09



Exporting green commodities

10



Developing of ancillary infrastructure

Detailed suggestions for subsequent mission development



A few pertinent issues remain under addressed or unaddressed, which will hopefully be dealt with in subsequent phases of policy development

- 1. Stipulation of sectoral demand mandates:** While production subsidies and other market forces can support demand creation, the jury is still out on whether these measures would be sufficient especially if they do not result in cost parity with grey hydrogen. It is therefore critical to announce **sectoral mandates of hydrogen consumption** for sending clear signals for the interested investors.
- 2.** The NHM envisages an outlay which constitutes only ~2.5 per cent of the target investment in the sector (INR19,744 crore vs INR8 lakh crore), which needs rationalisation. Further, the **allocation within SIGHT programme** for manufacturing-based incentives for electrolyser manufacturing and commodity production-based incentives is unclear and needs to be specified. It is important that the manufacturing-based incentives and commodity production-based incentives are envisaged such that these result in a reasonable reduction of the cost of generation of green hydrogen and bring this close to cost parity.
- 3. Holistic R&D efforts to promote self-sufficiency :** The proposed spend on R&D of INR400 crore is a welcome allocation, but clearly far more is needed to reduce stranglehold of a few entities over some critical raw materials. The US IJIA programme lays out a massive USD1 billion towards R&D aimed to reduce the cost of electrolysis⁴. EU's R&D spend under IPCEI Hy2Tech is Euro5.4 billion^{5,6}.
- 4. The definition of what constitutes green hydrogen, and the certification mechanisms** need to be focused on. While a qualitative definition of green hydrogen has been provided by Niti Aayog⁹, a more robust and concrete definition is required. This should include quantification of items such as daily or monthly banking proportion, etc. This could help harmonise the green hydrogen definition with importing destinations like EU, Japan, South Korea to aid seamless exports from India. Further, safety will be critical which will require massive training program across the value chain, given that hydrogen and its derivatives are a very difficult to handle.
- 5. India has strong global ambitions of exporting green hydrogen** and related derivatives but **significant efforts to ensure cost-competitiveness, are needed to realise this ambition.** Specific incentives on exports need to be looked at to bridge the gap in the form of appropriate fiscal incentives (cheaper interest rate, green bonds, dollar denominated bonds, etc.) and non-fiscal enablers (land allocation, stamp duty concessions, VGF, tax concessions, electricity duty reduction, water allocation, etc.). Without these incentives, meaningful exports from India may be challenging given the subsidies envisaged under USA's Inflation Reduction Act and Europe's public funding for hydrogen projects. However, we have a large enough domestic market to start with and that should be the focus until exports from Indian projects become globally cost competitive.
- 6. The GST and Customs duty for both equipment and sub-component level need to be reduced and harmonised** to ensure the manufacturing of competitively priced electrolysers. Also optimised production of green hydrogen may involve a strategy where power is drawn interstate by the electrolyser, which is situated near the demand location since transportation of hydrogen in the form of molecules over long distances is not cost economical at this time. However, this structure results in inefficient GST structures, which needs to be addressed through GST concessions.
- 7.** The government could look to introduce **concessional tax regime** (such as reduced capital gains tax, lower taxes on interest/dividend pay-out) for green hydrogen financial products to boost investment from both domestic and international markets. Additional impetus may be provided for listing green hydrogen financial products in the IFSC. The

⁴ NUS Department of Energy (DOE), 15 February 2022

⁵ European Commission Press Release, 15 July 2022

⁶ European Commission Press Release, 21 September 2022

⁷ USD/INR=80

⁹ Harnessing Green Hydrogen report, Niti Aayog, July 2022

current concessional income tax rate of 15 per cent is available to a company which commences generation of electricity or manufacturing/production of any article or thing on or before 31 March 2024. To encourage green hydrogen production, the sunset date of 31 March 2024 should be extended. Higher weighted deduction for research and development could be provided for boosting investments and developments of new technologies/capabilities. In addition to tax support, direct financing support for green hydrogen projects such as preferential financing schemes, dedicated access to financing bodies would be beneficial in bringing in investors.

- 8. Development of a holistic and all-round robust manufacturing system catering to all parts of the hydrogen value chain.** While this is mentioned in the R&D roadmap, the thrust on this must be clearer and stronger at even the sub-component level, and catering to all end-use sectors of hydrogen and not just be limited to electrolyser manufacturing and restricting hydrogen usage to a limited number of sectors. India could adopt manufacturing clusters, especially to facilitate the supply chain across the value chain closer to points of large-scale production or consumption of hydrogen. This could emphasise domestic manufacturing of electrolysers, fuel cells, cylinders, pipelines, hydrogen refuelling stations. etc.
- 9. Clarity and guidance on hydrogen based green commodities** is also needed, for example, for green metals, green ammonia to help mitigate the demand risk for Indian exports due to strict carbon-emission avoidance measures like CBAM, EU-ETS, etc. For example, as per market estimates, the **CBAM**

implementation may cause a significant loss of revenue from iron and steel exports to EU, compared to a non-CBAM scenario, because Indian steel exports to EU, as on date, are majorly produced using carbon-intensive BF+BOF process⁹. Hence, a strategy for greening these products with technologies such as green hydrogen and other levers need to be examined. This would be needed to provide guidance on future capital investments, retrofits, etc for these industries.

- 10. Lastly but also very importantly, as the massive infrastructure requirement in India is still to be built out, there is an opportunity for India to assume leadership in making sectors such as aviation, maritime, digital/telecom ab-initio green** and synergise with the green hydrogen growth and leapfrogging to latest technologies. For example, creation of green maritime corridors to cater to carbon-free shipping and forming bilateral or multilateral agreements for ammonia-powered international shipping routes. Green shipyards may help India take advantage of both green ammonia production and newbuilt ships produced to run on ammonia. Those may also help to revitalise Indian shipbuilding industry and invite global shipbuilders to manufacture 'green ships' in India. Similar initiatives need to be looked at in sectors such as aviation. Further, green hydrogen can be explored for building a green digital and telecommunication sector, for example, through powering new data centres or telecom towers by green energy source like hydrogen.

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Standardisation, safety and robust certification will be critical focus areas
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⁹ CCUS: Policy Framework and its deployment mechanism in India, Niti Aayog and MN Dastur & Co., November 2022



Conclusion

Overall, the NHM does signal a promising start with hopes of catalysing future growth.

The NHM sends strong directional signals on the intent of the government to address demand and supply side issues. This also sets high ambitions both for local market as well as export, although the domestic market by itself is large enough to focus on in the immediate stage. Overall, now with a strong policy setting structure, the eyes are on the empowered group MNRE and various sectoral ministries to see how different elements are detailed and delivered. Amongst the immediate asks from the industry are clear direction on the demand side mandates, incentives allocation and methodology

under the SIGHT programme, rationalisation of taxes and duties, standards and certifications, financing mechanisms, which can set the wheels in motion for business strategies. On innovation, the Mission will need to go beyond just the R&D funds under SHIP, to help reduce or remove dependence on critical resources and components, especially those on which there is dominance of a few suppliers globally. Finally, efforts such as aggregation of demand and centralised bidding can go a long way into stimulating the green hydrogen economy of India.



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